

Waukegan Manufactured Gas & Coke Plant Site

Principal Components of Groundwater Remediation Pilot Project

January 19, 2000

Meeting Objective

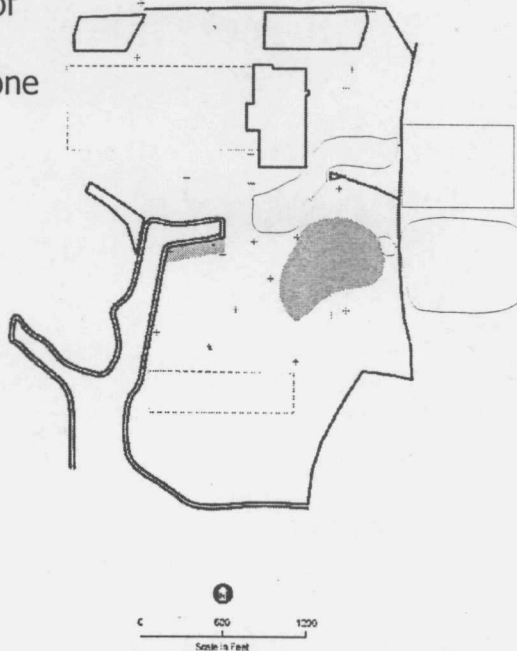
Reach Agreement on the Principal
Components of the Pilot Project



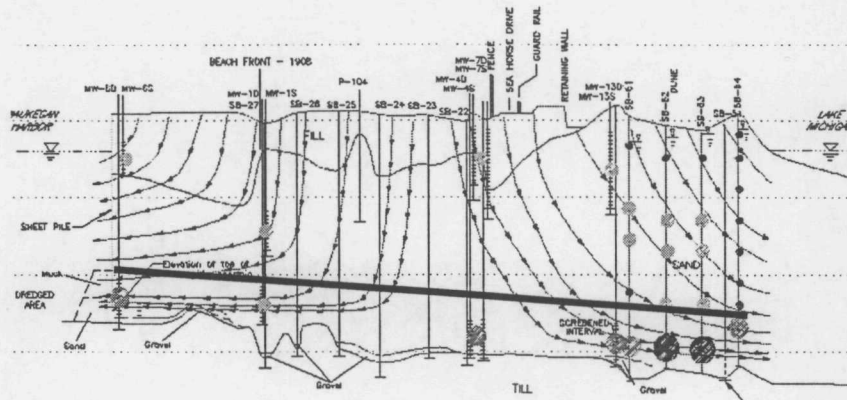
Presentation Topics

- Introduction
- Pilot Study Objectives
- Pilot Cell Layouts
- Pilot System Operation
- Pilot System Monitoring and Testing
- Extracted Water Treatability Study
- Decision Process
- Schedule

Lateral Extent of
Groundwater
Remediation Zone
(GRZ)



Vertical Extent of GRZ



ROD Groundwater Remedy

- Mobile, Cell-based, Low-flow Extraction
- Treatment of Extracted Water
- Re-injection of Treated Water
- Long-Term Monitored Natural Attenuation
- Long-term Monitoring
- Five-Year Reviews

Pilot Study Objective

- Determine Design Parameters/Constraints for Implementation, Operation, and Performance Measurement of the Mobile, Cell-based, Low-flow Groundwater Remedy

Information Needs

- Pilot Study Zone Characterization
- Hydrogeologic Constraints to Mass Removal/Reinjection
- Treatment Constraints/Natural Attenuation Threshold Criteria

A. Pilot Zone Characterization

- Geoprobe Vertical Profiling

aquifer characteristics

- Groundwater Samples:

- Installed wells

at bottom of aquifer

- Geoprobos

Pilot test on property vs. beach area.

B. Pilot Components

- Two Pilot Units

- Extraction/Re-injection Unit (E/R Unit)
(3 E Wells/6 R Wells)

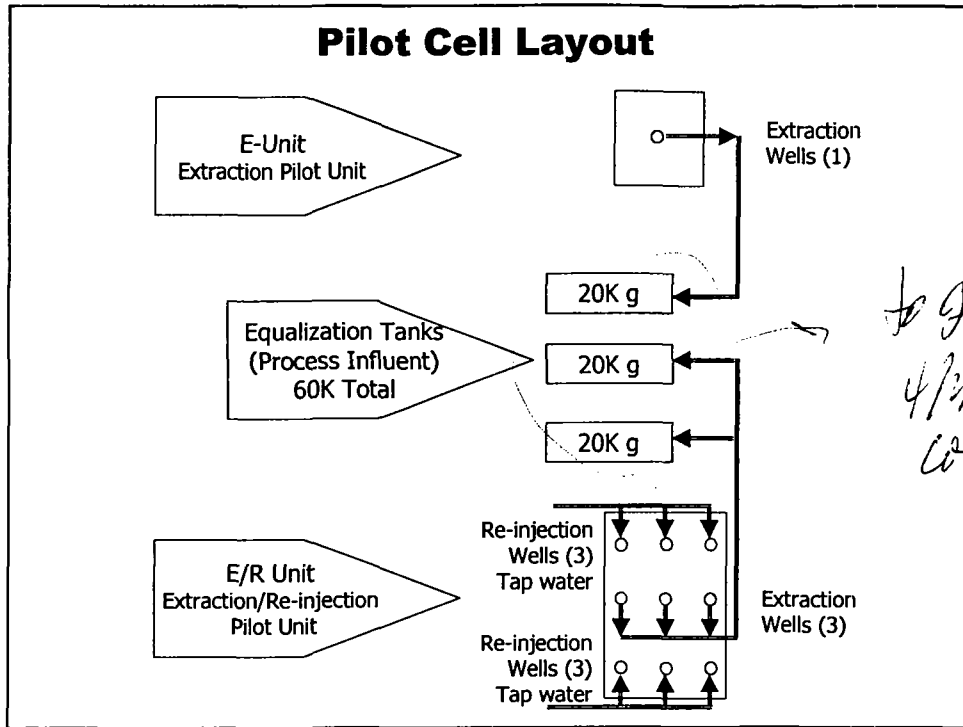
- Extraction Unit (E Unit)
(1 E Well)

- Storage of Extracted Water in Equalization Tanks (3 x 20,000 gal)

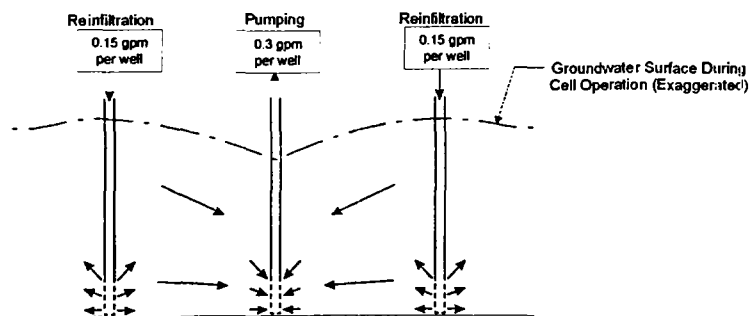
- Pilot Units Running Simultaneously

*to compare whether
injection
correctly dilutes
mass to be
removed.*

Pilot Cell Layout



E/R Unit

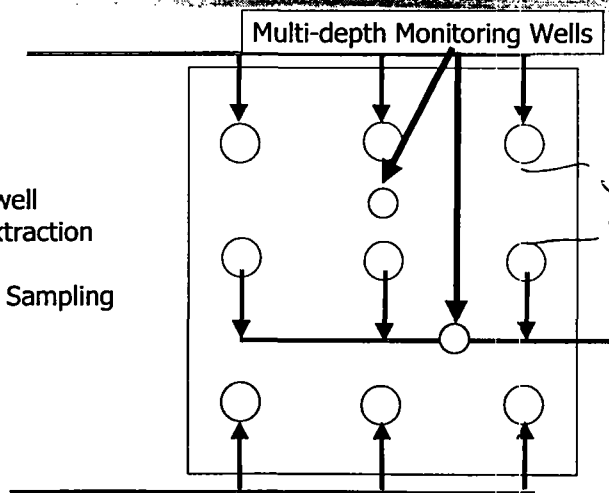


Pilot Units Monitoring

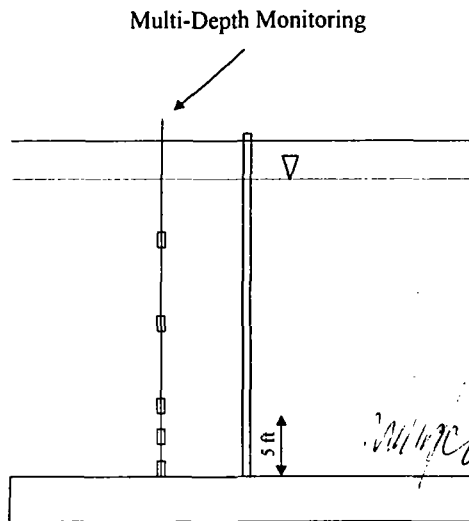
- Groundwater Sampling
- Bromide Tracer Tests
- Extracted Water Sampling

E/R Unit Sampling

Aquifer Sampling
Multi-depth samples
Extracted Water Sampling
Samples from each E well
Bromide Pulse Injection/Extraction
Tracer Test
Multi-depth and E well Sampling



Multi-Depth Monitoring



important area

E Unit Sampling

- Aquifer Sampling
 - Multi-depth Samples
- Extracted Water Sampling
 - E-well Samples

Hydrogeologic Data Analysis Goals

- Determine Removal Rate/Concentration Decay in E/R Unit
- Determine Impacts of Re-injection
 - Comparison of E/R v. E Unit Removal
- Determine Impact of Extraction Rate
 - Range of flow from E Unit
- Determine Effects of Sorption/Desorption
 - Intermittent Removal in E Unit
- Determine Impact of Pulse v. Continuous Extraction
 - Variable pumping in E Unit

C. Assessing Treatment Constraints

- Bench-Scale Treatability Test
- Sample Extracted Water from E/R and E Equalization Tanks
- Sequential Phenol and Ammonia Removal
 - Biological phenol removal following As removal
 - Nitrification following phenol and As removal
- Concurrent Phenol and Ammonia Removal
 - Simultaneous biological phenol removal and nitrification following As removal
- Determine Natural Attenuation Threshold Levels

vs. on-site pilot scale.

is As-biolog. inhibitor?

biological syst. doesn't tolerate variable inputs over short periods (w/ variable extr. rates or conc's)

con. for biological parameters (phenol, NH₃)

Decision Process (1)

- Spatial Configuration of Mobile Cells:
 - Cell E/R Wells Vertical/Horizontal Configuration
 - Effective E/R Rates
- Temporal Configuration of Mobile Cells:
 - Simultaneous v. Sequential E/R Units
 - Extraction/Re-injection Patterns (Within-cell v. Separate-cells)

Decision Process (2)

- Cell Performance Standards Verification:
 - E/R Performance Standards based on Removal of Natural Attenuation Inhibitors Subject to Hydrogeologic Constraints
 - Cell Operation Monitoring Plan
 - Cell Termination Rules and Procedures

Decision Process (3)

- Treatment System Components:
 - Determined Based on Removal of Natural Attenuation Inhibitors
 - Utilize Benefits of Nitrate and Oxygen
- Treatment Performance Standards Verification:
 - Performance Standards for Treated Water based on Impact on Natural Attenuation Inhibitors

Pilot Study Timeline

- Plans/Specification/QAPP/SAP
 - ~4 weeks
- Procurement/Mobilization
 - ~4 weeks
- Installation of Pilot Units and Equalization Tanks
 - ~4 weeks
- Unit Operations
 - E Unit: Intermittent/variable pumping up to 20k gallons; 8 weeks (7 days on/7 days off)
 - E/R Unit: Continuous E & R for 4 weeks
 - Follow-up Laboratory Treatability Testing of Equalized Extracted Water for ~4 weeks
- Data Compilation
 - ~4 weeks
- Pilot Report
 - ~4 weeks

Starting from WSPN approval

≅ ~ 8 months.

Pilot Report Outline

- Description of Study Components/Analytical Results
- Effective Extraction/Reinjection Configuration
 - Well configuration, depth, E/R rate
- Performance Standards for Cell Operation
 - In-situ concentration, mass removal, or volume removal subject to hydrogeologic constraints and/or NA inhibitors
- Performance Standards for Treatment Operation
 - Concentration or removal of NA inhibitors
- Performance Standard Measurement/Monitoring Plan

? As design document suitable
to attach to C.D. ?